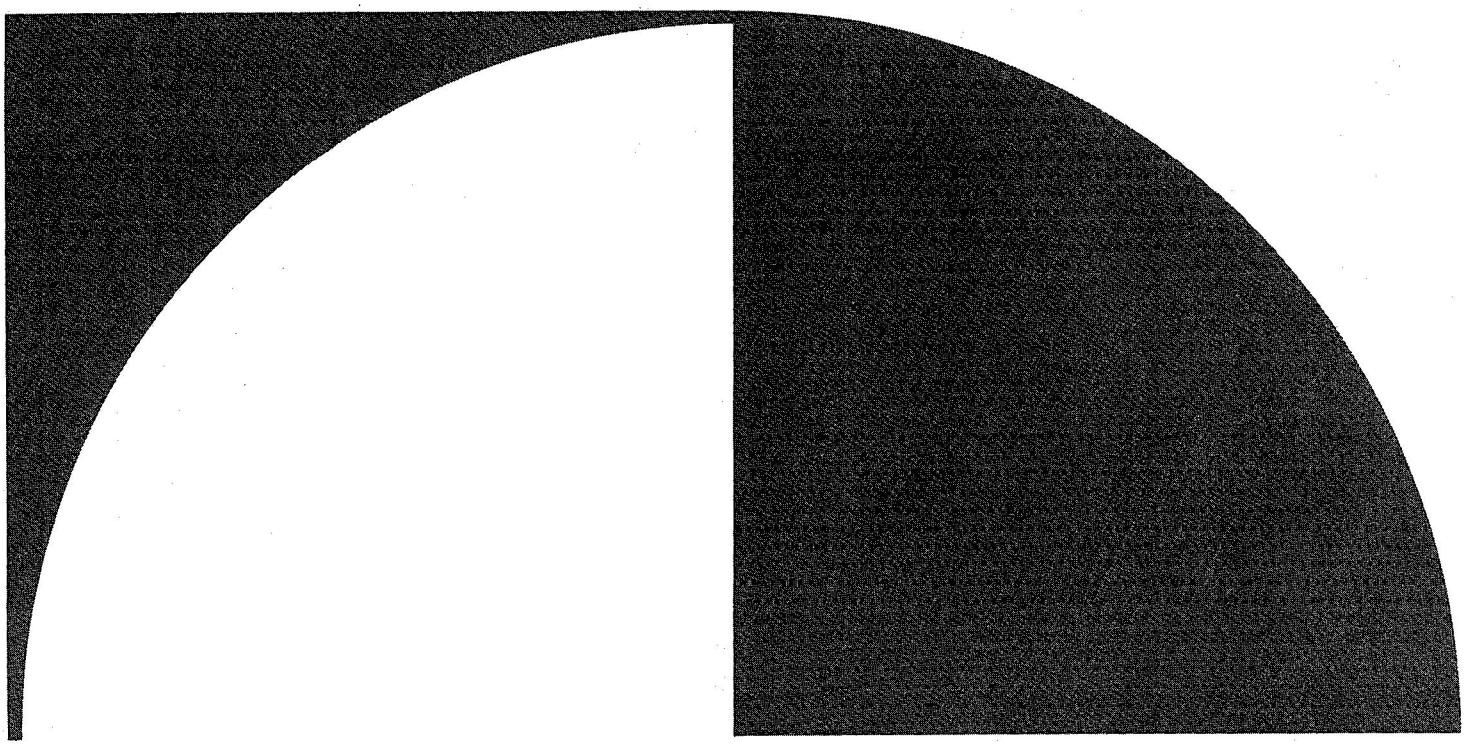
Nakamichi 500



2 Head Cassette System
Operating Instructions

WARNING – TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

Please record the Model Number and Serial Number in the space provided below and retain these numbers. Model Number and Serial Number are located on the rear panel of the unit.

Model Number: 500

Serial Number: _____

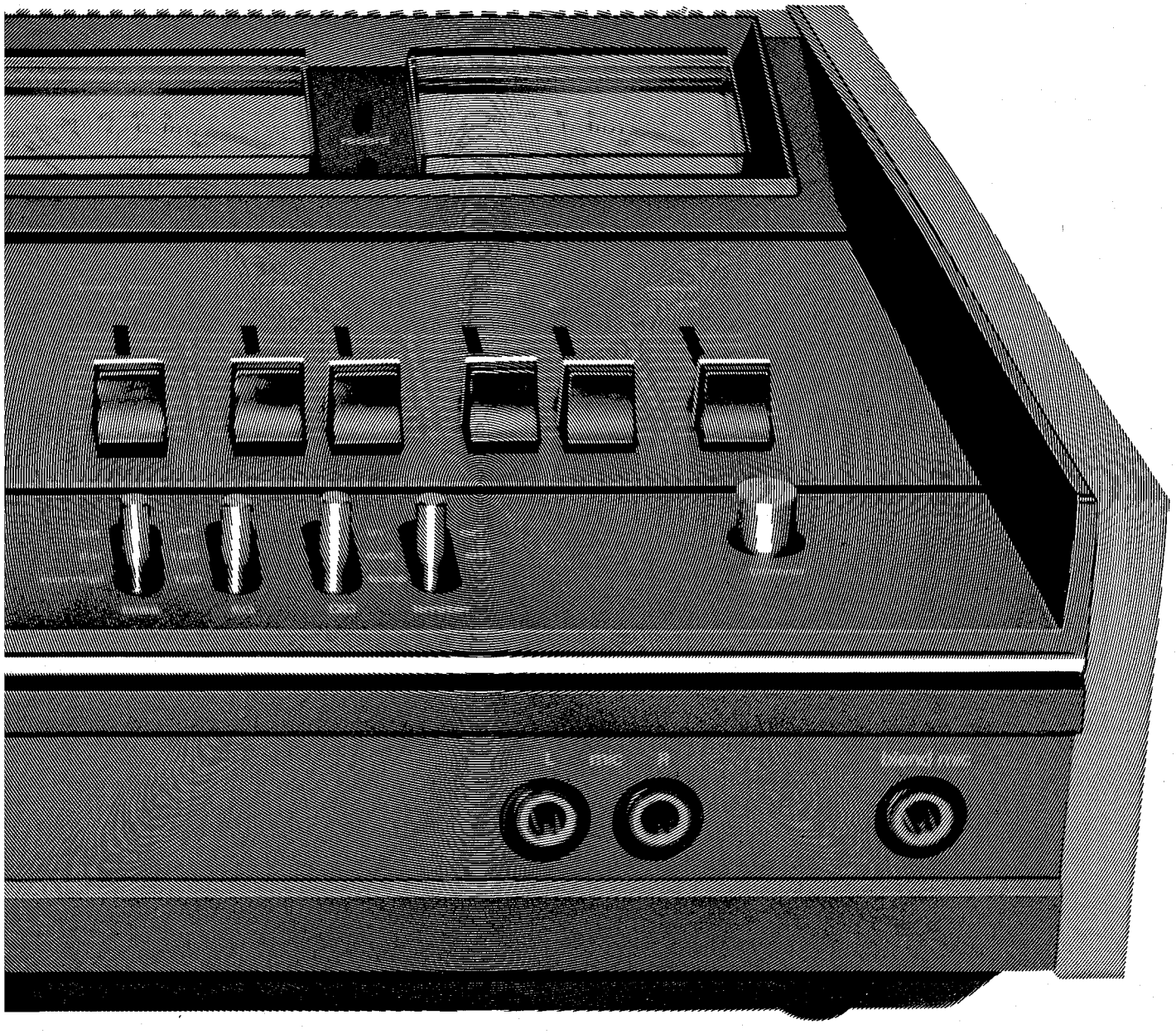
We thank you for your purchase of our Model Nakamichi 500.

This Model is incorporated with the technical know-how developed in our 3-Head Stereo Cassette Systems.

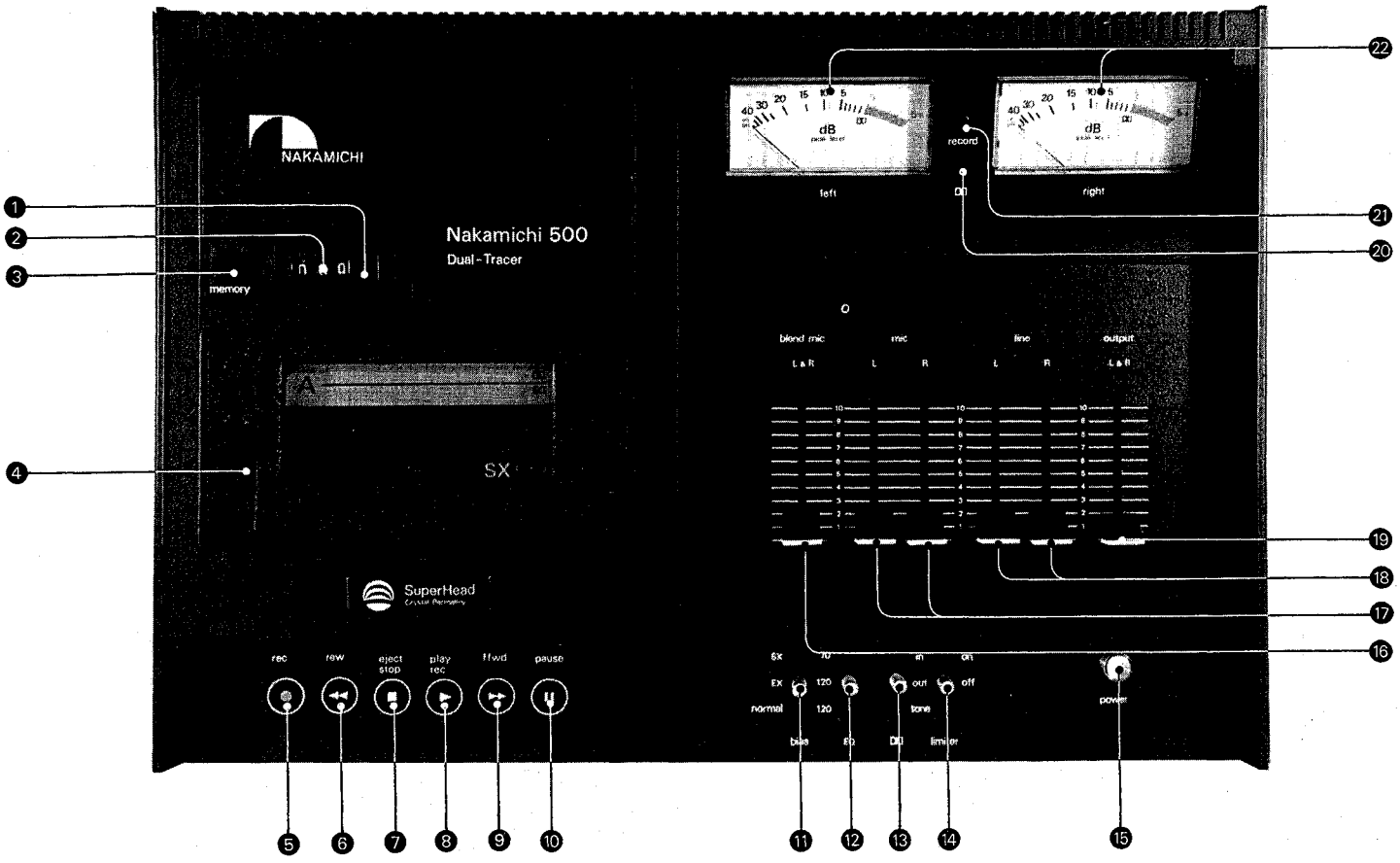
We do know you wish to play your Nakamichi 500 immediately. First, however, we must urge you to spend a few minutes to read this Instruction Manual. The short time will familiarize yourself with many unique features, and the proper operating techniques of this outstanding Cassette Deck will result in a more professional-sounding recording and will assure you of many year uninterrupted enjoyment.

Contents

Control Functions 2
Connections 4
Playback Procedures 5
Recording Procedures 6
Additional Recording and Playback Techniques 7
Dolby NR Level Calibration 8
Bias and Equalization 9
Peak Level dB Meter 10
The Dolby Noise Reduction System . 11
Maintenance 11
Trouble Shooting Chart 12
Specifications 13
Optional Accessories 13



Control Functions



1. Tape Counter Reset Button
Push the reset button, the counter will show "000" automatically.

2. Tape Counter
Confirms the positions of the start and stop of program.

3. Memory On/Off Switch
Prior to recording or playback, set the switch to "On" and the counter to "000", then the tape will stop at the "999" when rewound.

4. Cassette Lid
Push the Stop/Eject Button, then the lid will open.

5. Record Button
Recording will be commenced when pushed simultaneously with the Play Button.

6. Rewind Button
Causes tape to move rapidly from right to left reel.
Depress the STOP button or allow auto-stop to function.

7. Stop/Eject Button
The Stop Button shall be securely pushed from any of the modes. When the button is further depressed, the Cassette Lid will be opened and the cassette ejected.

8. Play Button
Tape runs at the standard speed and when the button is depressed, playback of the pre-recorded tapes will commence. Also engaged in conjunction with the Record Button for recording.

9. Fast Forward Button
Causes tape to move rapidly from left to right reel. When tape reaches the end, depress the STOP button or allow auto-stop to function.

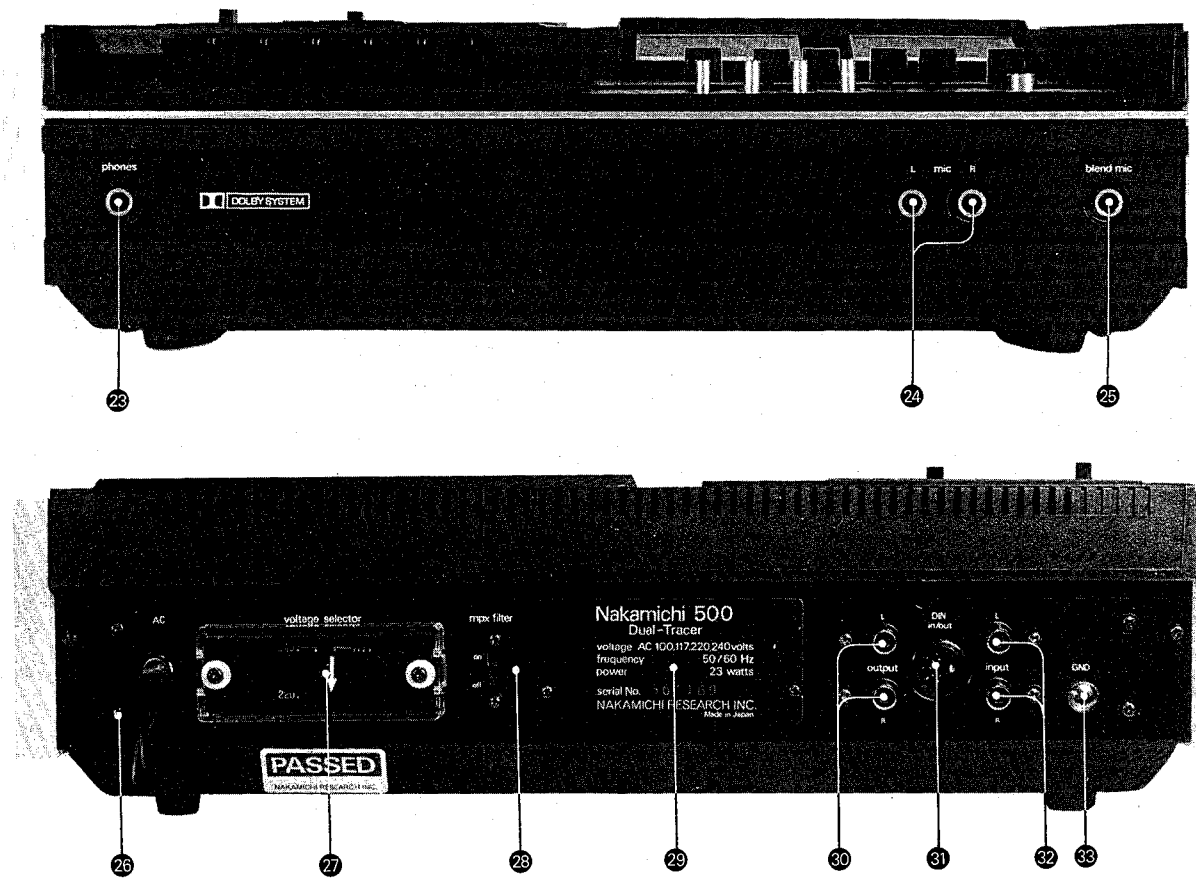
10. Pause Button
Used to momentarily stop the tape in recording or playback modes. When depressed during recording, the recording circuits remain operative, and capstan remains in motion but pinch roller is retracted.

11. Bias Switch
Varies the bias for the correct level according to the type of tape to be used, such as Normal, EX and SX (Refer to Page 9.)

12. EQ (Equalization) Switch
According to the tape to be used, select one of the types of Normal, EX, or SX (Refer to page 9.)

13. Dolby NR Switch/Test Tone
When placed in the IN position, activates the Dolby circuits for recording or playback. In case of not Dolbyized tape, place to the OUT position for normal record and playback. Further, when set to TONE position, you can obtain 0dB reference level signal. (Refer to page 8.)

14. Limiter Switch
When set to ON, activates only when there comes in a sudden strong peak input, and prevents distortion, in Recording mode.



15. Power Switch
Apply AC power, then the level meter lamps will illuminate.

16. Blend Mic Level
Serves as the Level Control of the Blend Mic Input, by which you can do mixing equally with Mic L and R, and Line L and R Inputs.

17. Mic Level Input Controls
Being the Level Controls of the Mic L and R, which enable the Mic L and R Inputs can be subjected to mixing with the Blend Mic Input and Line Input.

18. Line Level Input Controls
Being the Level Controls for Line L and R, by which the Line L and R can be subjected to mixing with all Mic Inputs.

19. Output Level Control
Possible to simultaneously vary the Output Levels of L and R regardless of the indications of the meters.

20. Dolby Lamp
Illuminates when set to ON.

21. Record Lamp
Illuminates while recording.

22. Peak Level Meters
The Meters indicate a wide range from -40 dB to +5 dB, the 0 dB of which conforms to the Dolby NR Standard Level.

23. Headphone Jack
Provides source monitor during recording, allows private listening during playback.
Will accept standard stereo headphone of 8 ohms impedance.

24. Mic L and R Input Jacks
Low impedance microphone of 600 ohms will work satisfactorily.

25. Blend Mic Input Jack
Low impedance microphone of 600 ohms will work satisfactorily.

26. AC Power Supply Cord

27. Voltage Selector Plug
You can change over to either 100V, 117V, 220V or 240V.

28. MPX Filter Switch

29. Record Calibration Controls
Enable you to set L and R, and the Dolby Standard Level to Normal, EX and CrO2 tapes to be recorded. (Refer to page 8 for Level Calibration).

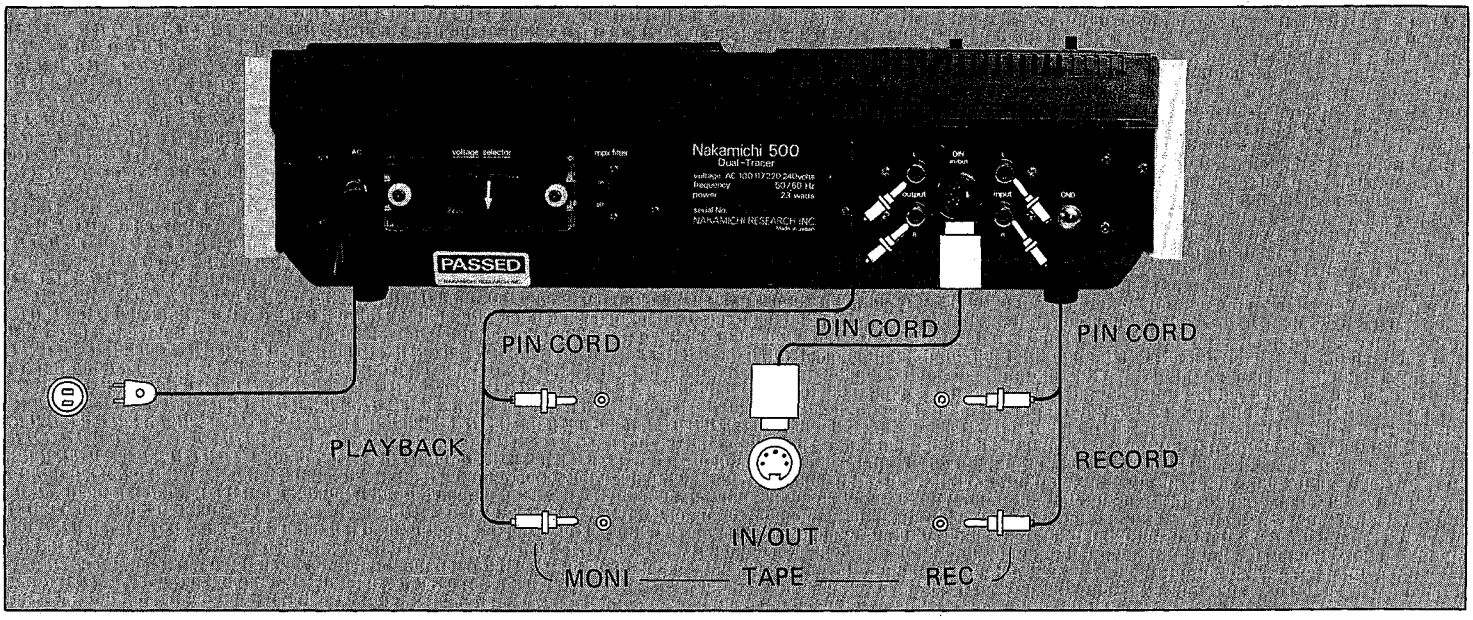
30. Output L and R Jacks
Connect to the amplifier with a standard pin jack.

31. DIN In/Out Socket
To be connected with a DIN Cord.

32. Line Input L and R Jacks
Input jacks for the desired source (i.e. tape deck or stereo receiver), with a Standard Pin Jack.

33. Ground Terminal

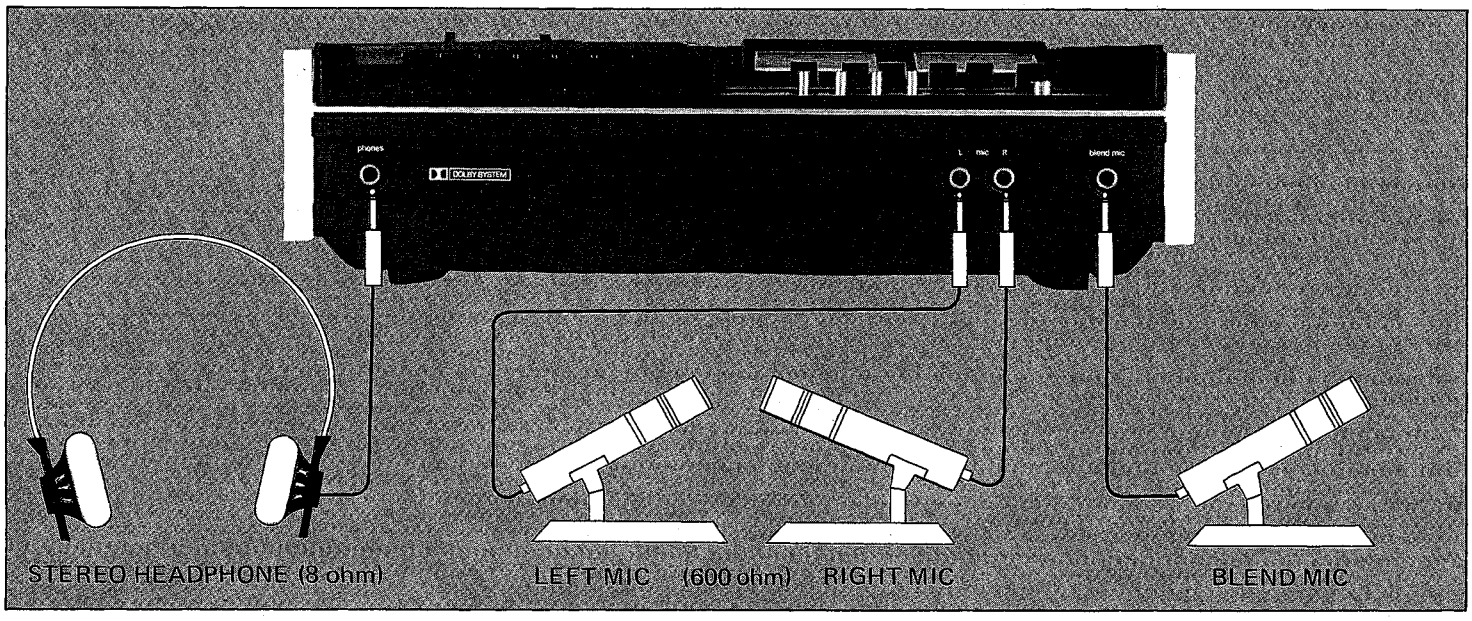
Connections



Connecting the Line Output:
Connect to the Tape Monitor of your Stereo Amp or AUX Jacks from the Output Jacks through pin cords.

Connecting the Line Input:
Connect to the Tape Rec Jacks of your Stereo Amp from the Input Jacks through pin cords.

Connecting the DIN Connector Socket:
If your Stereo Amp is equipped with a DIN Connector Socket, connect with a DIN cord. In this case, please do not use pin cords simultaneously.

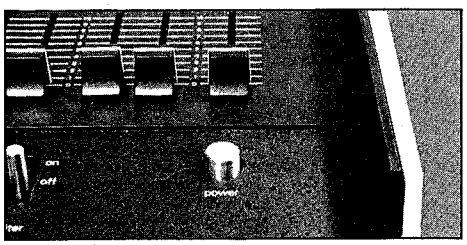


Microphones and Headphone
As shown in the above Fig., both of the right and left Stereo Microphones and the Blend Microphone can be connected.

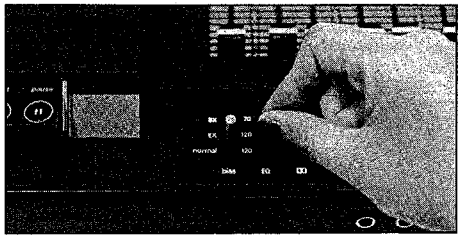
Please use the microphones having impedance of 600 ohm.
Insert the Stereo Headphones into the Phone Jack as shown in the above Fig.

Please use the headphone having impedance of 8 ohm.

Playback Procedures



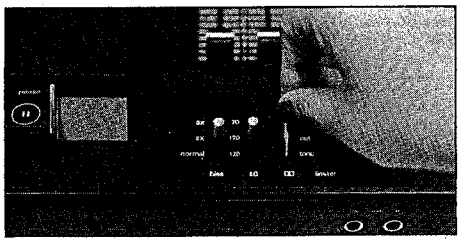
1. Set the Power Switch to ON, then the Level Meters will illuminate.



5. Set the EQ to the suitable position according to the cassette tape in use.

9. When you pushed the Pause Button, the tape will stop temporarily, and when you again push, the running will be commenced.

2. Depress the Stop/Eject Button all the way down to open the Cassette Lid.



6. When you playback a tape recorded with Dolby NR In, please set Dolby NR Switch to IN.

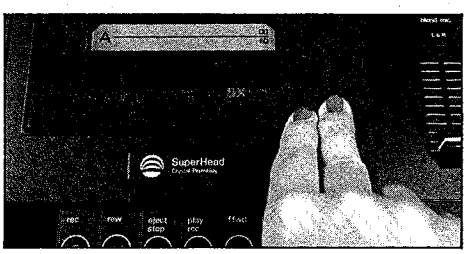
10. The tape will stop when the STOP Button is pushed, and the cassette in the compartment will be ejected when further depressed.

11. At the tape end, tape run will automatically stop and the button will be released.

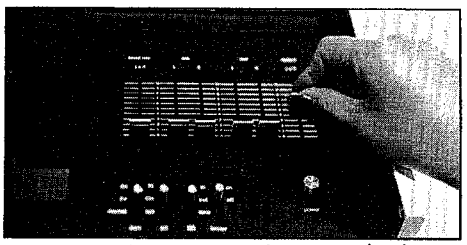
12. Insert the Stereo Headphones into the Headphone Jack, you now can listen to your own recording. Volume can be adjusted by the output volume.

3. Place a cassette in the Cassette Compartment.

7. Push the Play Button.



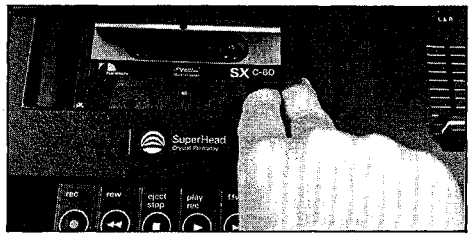
4. Depress the Lid till the cassette is securely placed.



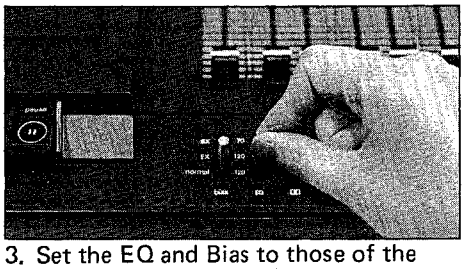
8. Adjust the output volume to obtain suitable volume.

Record Procedures

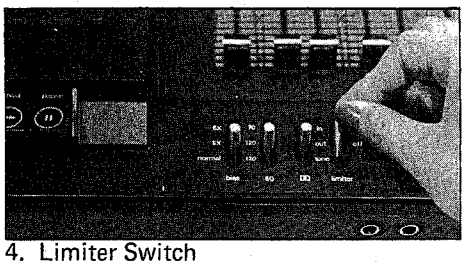
1. Open the Cassette Lid upon depressing the Stop/Eject Button.



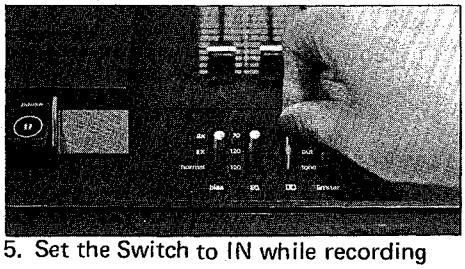
2. Put the cassette in the compartment, full reel of tape on your left.



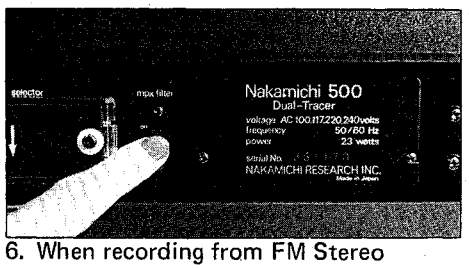
3. Set the EQ and Bias to those of the tape (Refer to Fig. 9).



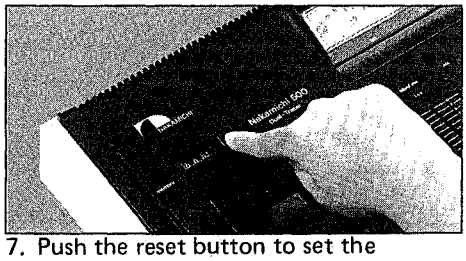
4. Limiter Switch
Prevents distortion particularly while live recording.



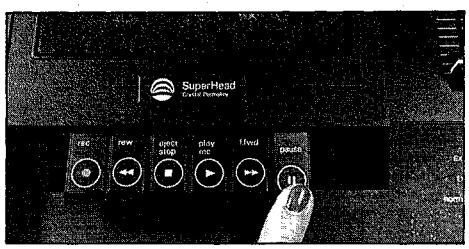
5. Set the Switch to IN while recording with Dolby NR IN.
(Refer to page 8 for Test Tone.)



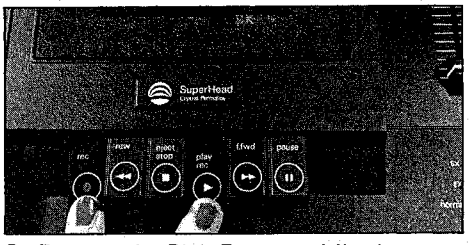
6. When recording from FM Stereo Broadcasting, set the MPX Filter at the rear panel to ON.



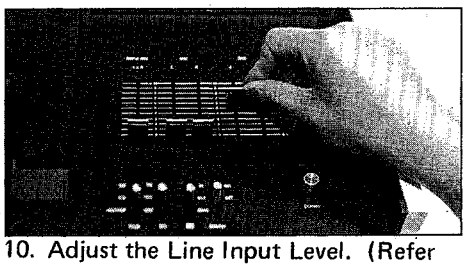
7. Push the reset button to set the Counter to "000". Then set the Memory Switch to ON at the starting point of recording.



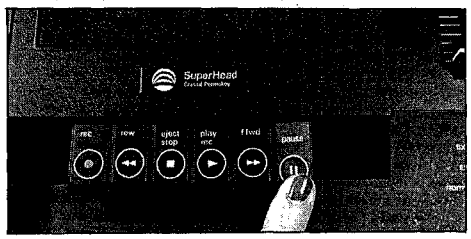
8. Push the Pause Button.



9. Depress the Play Button while the record button is being pushed.
The Record Lamp will then illuminate showing recording is ready.



10. Adjust the Line Input Level. (Refer to page 10 Level Adjustment.)

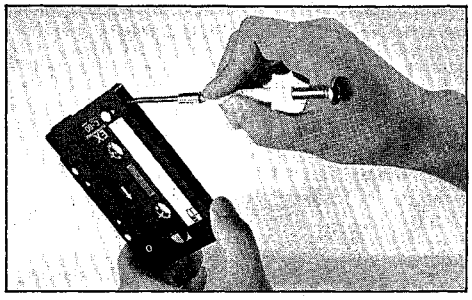


11. When level setting is completed, start the tape upon pushing the Pause Button.

12. When recording is finished, stop the tape by pushing the Stop Button.

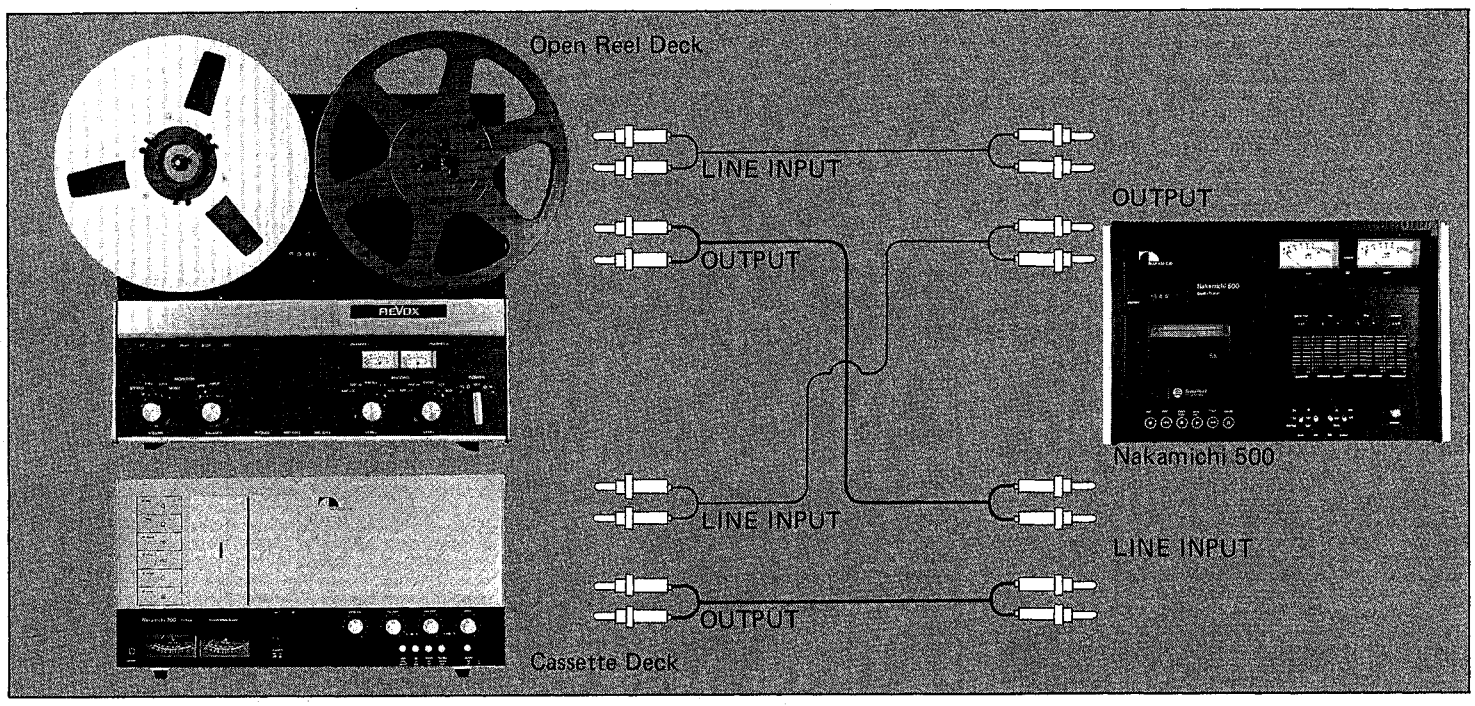
13. When the tape comes to an end, tape run will automatically stop and the push button will also be released.

A cassette has 'tabs' as illustrated below, on the side opposite to that exposing the bare tape. If you break them off with a screwdriver or the like of it, the cassette will prevent the depression of the RECORD Button, thus eliminating the possibility of erasing a valuable recorded cassette by mistake. Take advantage of this feature when you want to preserve a cassette into which you've made important recordings. If you want to preserve the recording in only one side, break only one of the tabs, referring to the illustration below.



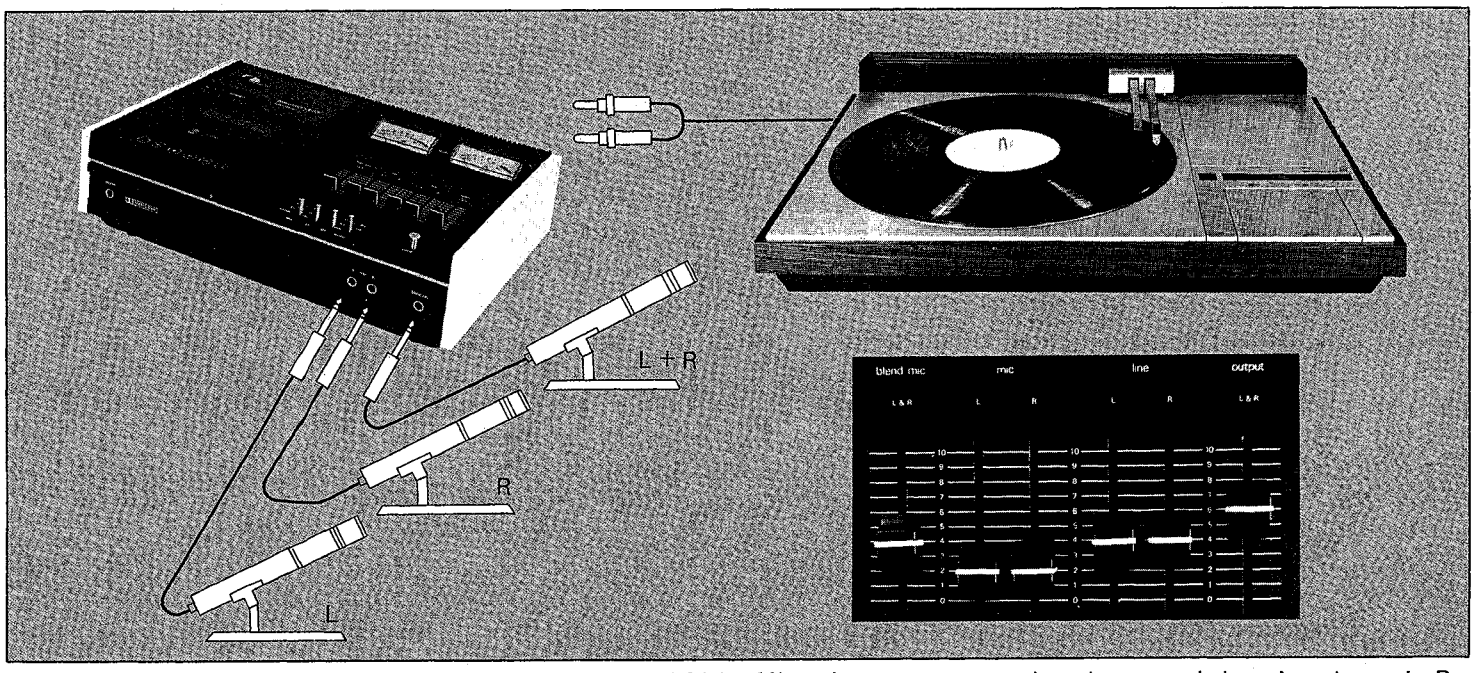
Note:
Should you ever want to make a recording into a cassette with such tabs already broken, seal the tab openings with masking tape or plug it with eraser rubber, etc.

Additional Recording and Playback Techniques



Direct Copying from Tape to Tape:

The Nakamichi 500 is a 2-Head Cassette Deck, however it is also true that the Model has the characteristics close to those of the Nakamichi 3-Head Cassette Systems 1000 and 700. Accordingly, you can perform HI FI recording from open reels and high quality cassette decks, alike the original source.



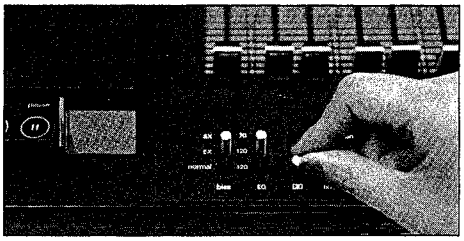
Record Mixing

Nakamichi "500" serves also as a small type mixer through 5 different individual volume controls, namely Line Inputs Left and Right, Microphone Inputs Left and Right, and the Blend Microphones. As shown in the Fig. below, the mixing of a disc record with microphones, and also microphones L, R with Blend (L + R) microphone, can be conducted.

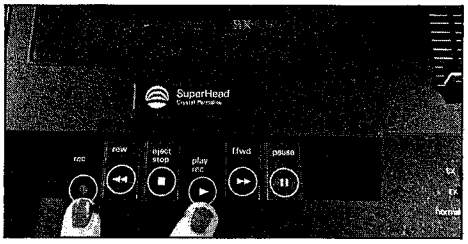
Dolby NR Level Calibration

Dolby NR Level Calibration

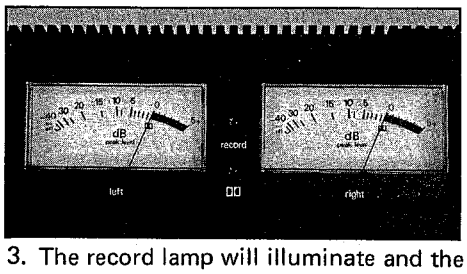
The Dolby NR standard level (200 nW/m) of the Nakamichi 500 is set to 0 dB.
Particularly, when you record with Dolby NR IN, adjust the 0 dB signal of the built-in 400 Hz Test Tone to 0 dB according to each of the tapes to be used.



1. Set the Dolby NR Switch to Tone.



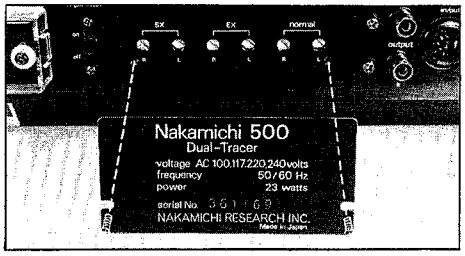
2. Place the tape to be recorded in the cassette compartment, push the Pause Button, then depress the Play Button while the Record Button is being pushed down.

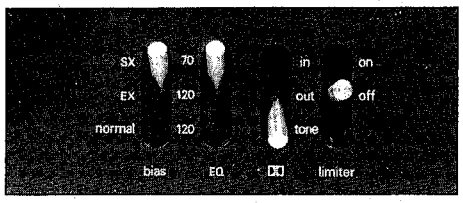


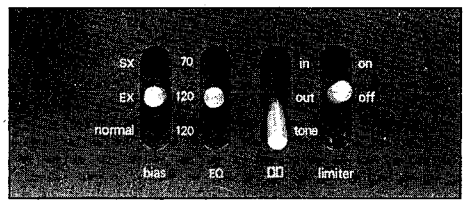
3. The record lamp will illuminate and the dB meter will indicate 0 dB.

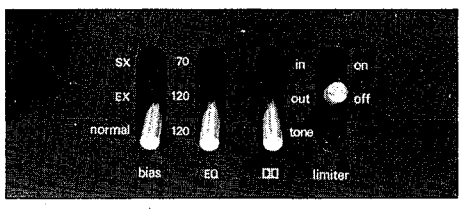
4. Set the position of the Tape Selector Switch according to the type of tape in use. (Refer to page 9)

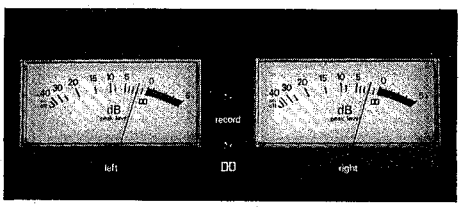
5. Release the pause button and record the test tone for approximately 10 seconds. Stop the tape, rewind and play back the tone. If the meters indicate within 1 dB of "0 dB", no calibration is necessary. If not, proceed with the following steps.

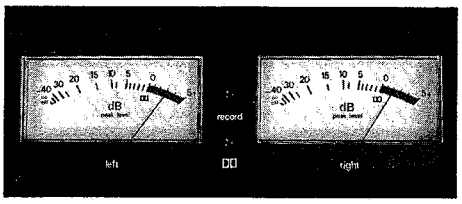






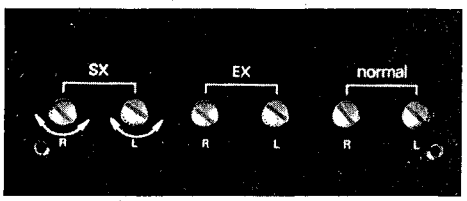


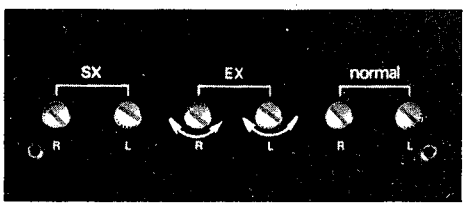


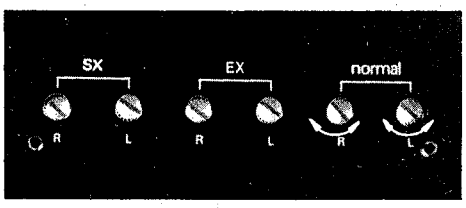


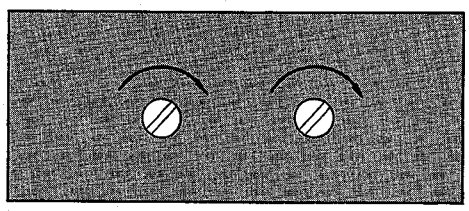
6. Stop the tape. If the level during playback was too low, adjust the appropriate level calibration control (Left or Right, SX, EX, or Normal) clockwise. If too high, adjust counter-clockwise.

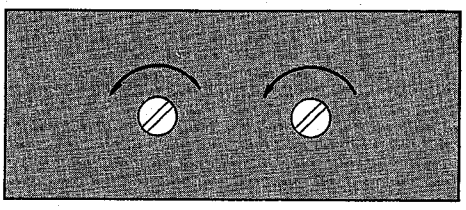
7. Then, record the 400Hz test tone again rewind and play it back. Stop the tape and repeat the adjustment if necessary. Repeat this procedure until the meters indicate within 1 dB of "0 dB".







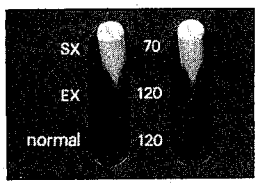
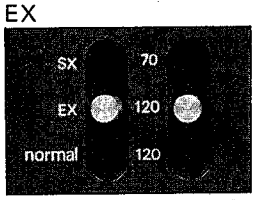
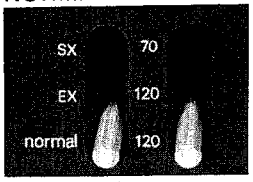




Note:
The RECORD LEVEL CALIBRATION controls affect the record sensitivity. Do not expect the meter indications to change while you are adjusting the RECORD LEVEL CALIBRATION control, either in record or playback. It is only after you have adjusted the controls, re-recorded the tone and played it back (in that order) that you will for the first time notice any change in the meter readings.

Bias and Equalization

The various cassette tapes available on the market represent a wide range of tape characteristics. For optimum results with any tape the bias and equalization of the cassette deck must be properly selected to match the characteristics of that tape.

Position of Bias Switch	Position of Eq. Switch	Brand	Type or Model	
SX 	70μs	Nakamichi TDK Maxell	SX SA UDXL-II	C-60, C-90 C-60, C-90 C-60, C-90
EX 	120μs	Nakamichi Nakamichi Fuji Maxell Maxell TDK	EX EXII FX UD UDXL-I AD	C-60, C-90 C-60, C-90 C-60, C-90 C-60, C-90 C-60, C-90 C-60, C-90
NORMAL 	120μs	Fuji Maxell TDK	FL LN SD	C-60, C-90 C-60, C-90 C-60, C-90

Shown above are the recommended cassette tapes and the proper bias and equalization settings for each (tapes other than Nakamichi are listed in alphabetical order).

Bias Switch

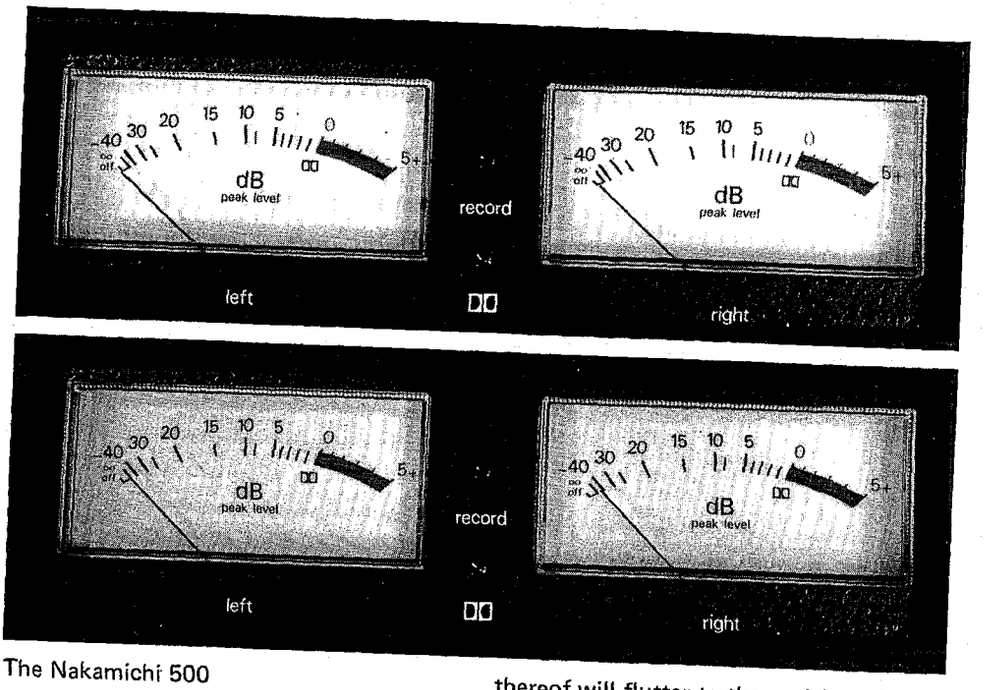
Bias is an inaudible high frequency signal applied to the tape during the recording process. It reduces distortions and non-linearities inherent in magnetic recording. For many years there was basically one type of tape so that only engineers needed to concern themselves with bias. Today there are a multitude of tape formulations, and almost as many differing biasing requirements. Nakamichi EX tape and other low-noise/high-output/high-density type tapes require some 10% greater bias than normal ferric oxide tapes for optimum results. High-coercivity tapes, such as Nakamichi SX, require approximately 45% greater bias. The three-position bias switch on the Nakamichi 500, therefore, allows the selection of the proper bias for the various types of cassette tapes.

Equalization Switch

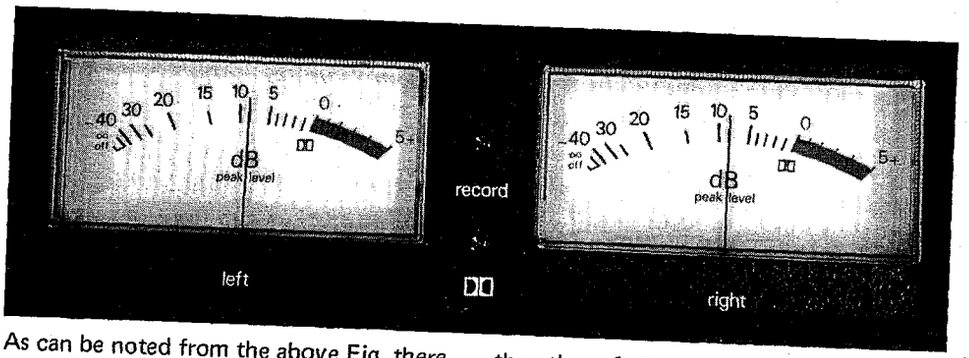
Equalization (EQ) is the method by which optimum signal-to-noise ratios and frequency responses are obtained for the various tape formulations. Like bias, the proper EQ must be selected for each kind of cassette tape. Unlike bias, EQ concerns not only the recording process but the playback process as well. The EQ switch, therefore, must be properly set for both playback and record.

There are two equalization "curves" now recognized as standards throughout the cassette industry. All conventional ferric oxide tapes and the newer low-noise/high-output formulations (including Nakamichi EX and EX II) utilize the 120 microsecond equalization time constant. High-coercivity tapes, such as Nakamichi SX, utilize the more recently established 70 microsecond time constant. Select the proper time constant with the EQ switch for record and playback by referring to the table of recommended cassette tapes.

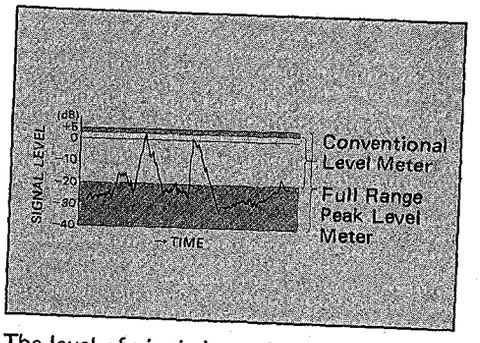
Peak Level dB Meter



The Nakamichi 500 incorporates a genuine Peak Level Meter which covers a wide range of -40dB to +5dB. While the power switch is off, the indicators are in the state of OFF. But when the power switch is set to ON, the Meters illuminate and the indicators thereof will flutter to the position of ∞. Being different from other indicators used in the conventional type meters, the indicators of Nakamichi 500 can also correspond to a sudden peak input.



As can be noted from the above Fig, there provided at -8dB is a red mark, to which please position 0dB of the 15 ips 2 track open reel tape recorder when you wish to perform direct copying therefrom, and by doing so, you can conduct desirable recording without saturation even though there comes in a sudden strong peak input. The saturation point of 15 ips 2 track open reel tape recorder is generally said to be at about +15dB, however the saturation point of the cassette is lower than that of 15 ips 2 track. Accordingly, if you set to the value in the neighbourhood of −8dB, it will become about +7dB while 15 ips shows + 15dB. This prevents increase of distortion. Depending upon a level of signal source, there may be a case in which S/N becomes lowered because of too low levels of signal source, and therefore please make selection of a level referring to the said mark.



The level of pianissimo while a classical music performance is said to be around −35dB. Thus it is impossible for −20dB Meters to detect such a small level. Nakamichi 500 Peak Level Meter can accurately indicates that level and even smaller, together with a big level of forte. Please therefore set your recording level according to each case.

The Dolby Noise Reduction System

Your Nakamichi 500 incorporates the Dolby Noise Reduction System (Under license from Dolby Laboratories, Inc.), originally developed to produce a master tape from which to cut records with a high signal-to-noise ratio.
Noise heard from a recorded cassette primarily comprises tape noise and the noise produced by the playback equalizer amplifier of the cassette tape deck, and is largely distributed over a 2KHz to 10KHz range. Such noise can be effectively reduced by amplifying signals within this range at the time of recording, then attenuating them in playback, through a process as illustrated in Fig. 1.

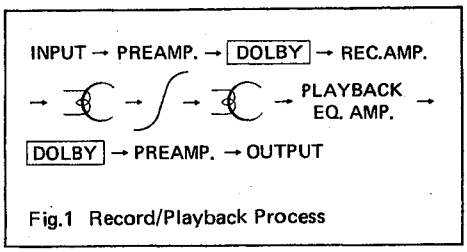
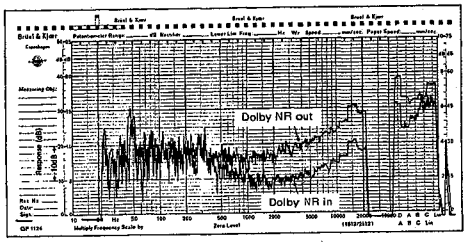


Fig.1 Record/Playback Process

If this treatment is given to such signals regardless of their strengths, however, strong high-frequency signals cannot be recorded. So it is necessary to change the gain of this special circuit with respect to the strength of the high-frequency signals. The Dolby circuit makes this possible. For instance, if high-frequency signals of −30dB enter the Dolby circuit from input terminals, it delivers signals of −20dB for recording on to the tape. Conversely, if high-frequency signals of −20dB enter



the same circuit from the playback head (Fig. 2), it delivers signals of −30dB for reproduction from the stereo amplifier. Thus input/output signals are attenuated by 10dB, with equivalent reduction in the level of tape noise and equalizer amplifier noise. The circuit is designed so that it does not affect signals of −5dB or greater.

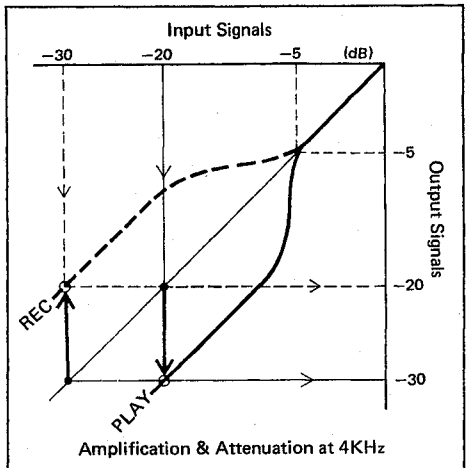
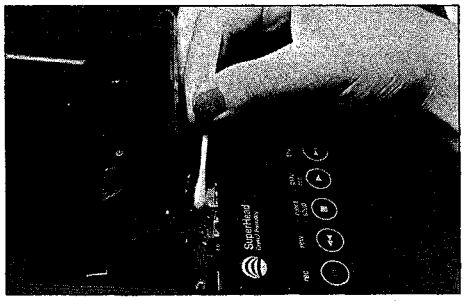


Fig.2 Working Principle of Dolby Circuit

As is clear from the foregoing explanation, the signal-to-noise ratio of sound improves by about 10dB if it is recorded and reproduced through the Dolby circuit, enabling you to enjoy clean, transparent hi-fi stereo sound. This system is international, and recordings made under it can be reproduced by any cassette or reel-to-reel tape decks equipped with the same system, regardless of their makes.

Maintenance



Cleaning

All parts that come into contact with the tape must be frequently cleaned. Even the best tape formulations leave a deposit of oxide sheddings on the heads, pinch roller and capstan. Failure to perform a periodic cleaning of these parts can result in signal dropouts, loss of high frequencies and wow and flutter. A cleaning kit is supplied with the Nakamichi 500, but some Q-tips and isopropyl alcohol (preferrably undiluted) will perform quite adequately.

Maintenance

Demagnetizing

All metal parts that come into contact with the tape must be occasionally demagnetized to prevent the build-up of residual magnetism that can add hiss to and partially erase the high frequencies on a tape being played. Although the heads and capstan of Nakamichi cassette decks require demagnetization much less frequently than most other tape decks, it should nevertheless be performed once every 50 hours of use to be on the safe side. A Nakamichi Demagnetizer is recommended for this purpose since it is specially designec for ease of use with cassette decks, but any properly designed demagnetizer will do. Remove all tapes from the vicinity of the tape deck before proceeding. Make sure the tape deck is "OFF." Turn the demagnetizer on and slowly bring the tip as close as possible to the record/play head (it is not necessary to demagnetize the erase head). Do not make contact with the head unless the tip of the demagnetizer is covered with thin vinyl or rubber to avoid scratching the surface of the head (a piece of vinyl tape may be used to cover the tip if it is not already covered). Move the demagnetizer tip slowly in a random pattern about the surface of the head for at least 10 seconds and then slowly move it toward the capstan. Repeat with the capstan, and then slowly withdraw the demagnetizer. Turn it off after it is at least 2 feet from the deck. Never turn the demagnetizer off while it is close to the head or capstan as this may semi-permanently magnetize the metal part.

Lubrication

The moving parts of the Nakamichi 500 transport are fitted with oil-less bearings. It is not necessary for the user to provide lubrication.

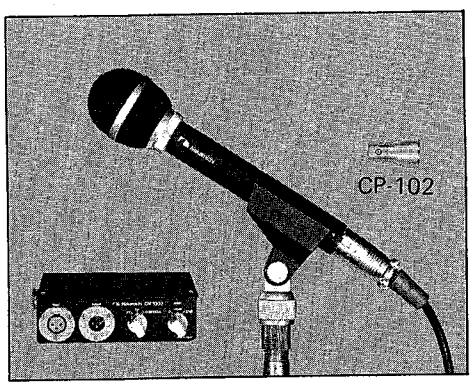
Trouble Shooting Chart

Condition	Probable Cause	Remedy
Tape does not run.	1. Power cord is unplugged. 2. Tape is loose inside cassette. 3. Cassette lid is not firmly closed.	Plug in power cord firmly. Wind tape up. Eject cassette and reset it carefully.
RECORD Lamp does not light.	1. Cassette is not loaded. 2. Cassette tabs are broken off.	Load cassette. Place a piece of adhesive tape over the tab opening.
Hissing sound is heard in playback.	1. Head is magnetized.	Demagnetize head with head demangetizer.
Tape travel is unsteady.	1. Capstan shaft and/or pinch roller are dirty. 2. Tape winding inside cassette or tape guides are faulty.	Clean those parts. Replace cassette.
Previously recorded sound remains.	1. Erase head is contaminated.	Clean erase head and pinch roller.
Reproduced sound is distorted.	1. Program material itself is distorted. 2. Recording volume levels are too high.	Examine program material. Adjust appropriate recording level controls. In case it is distorted at transient peaks, turn on the Peak Limiter Switch.
Cannot record.	1. Connection to each part is incorrect. 2. Record head is contaminated.	Check connections. Clean head.
Cannot reproduce.	1. Connection to each part is incorrect. 2. Playback Record head is contaminated.	Check connections. Clean head.
Large hum noise is heard in recording.	1. Disturbing induction field exists nearby the deck. 2. Connector cord grounding is defective.	Keep away from amplifier, transformer, fluorescent lamp, etc. Use the perfect connector cord.

Specifications

Power Supply	100, 117, 220, 240V 50/60Hz
Power-Consumption	40W Max.
Tape-Speed	1-7/8 ips.
Wow & Flutter	0.13% WTD peak
Frequency Response	40Hz - 17KHz ± 3dB (SX or EXII tape) 40Hz - 15KHz ± 3dB (Low noise tape)
Signal to Noise Ratio	Better than 63dB (Dolby NR In, Wrms CCITT 400Hz 3% Distortion)
Total Harmonic Distortion	Less than 1.5% (at 400Hz, 0dB SX or EX II tape)
Erasure	Better than 60dB (at 1KHz 0dB Saturation Level)
Channel Separation	Better than 35dB (at 1KHz 0dB)
Cross Talk	Better than 60dB (at 1KHz 0dB)
Bias Frequency	105KHz
Input:	
Mic	0.2mV 600 ohm
Blend Mic	0.2mV 600 ohm
Line	70mV 150 Kohm
DIN	13mV 25 Kohm
Output:	
Line	1.0V (Max.) Variable
Headphones	1mW 8 ohm (0dB)
Dimensions (Approx)	15"(W) x 4-1/2"(H) x 10"(D)
Weight (Approx)	15-1/2 lbs.

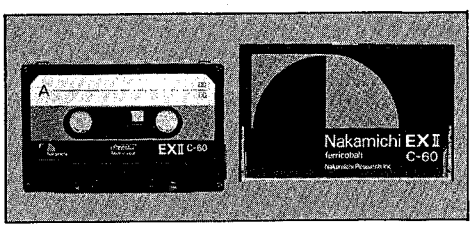
- Specifications and appearance design are subject to change for further improvement without notice.
- Dolby system under license from Dolby Laboratories Inc.
- The word "DOLBY" and the Double-D-Symbol are trademarks of Dolby Laboratories Inc.



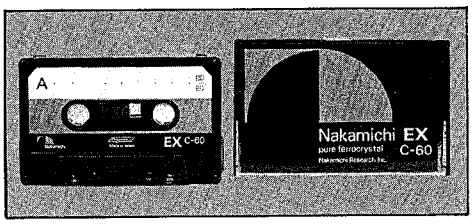
Condenser Microphone CM-1000
CP-101 capsule CP-102 capsule option

Optional Accessories

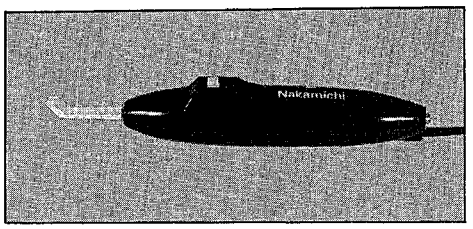
SX Tape C-60, C-90



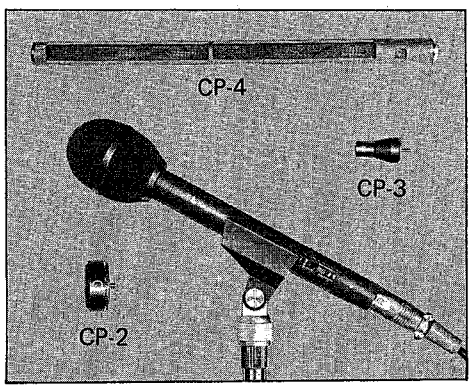
EX-II Tape C-60, C-90



EX Tape C-60, C-90



DM-10 HEAD Demagnetizer



Electret Condenser Microphone
CM-300
CP-1 capsule
CP-2 capsule
CP-3 capsule option
CP-4 capsule option